

Interlaboratory Study
MOE 04-01

Toxicity Characteristic Leachate Procedure
(TCLP)

January 21, 2005



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1. INTRODUCTION

This work was conducted as a supplementary project to Interlaboratory Study 2002-1: Toxicity Characteristic Leachate Procedure (TCLP)¹. This follow-up study was based on the examination of two leachates and two waste materials and the application of a prescribed TCLP. This report provides a preliminary statistical summary of the results. Another report is planned which will incorporate a detailed scientific evaluation of the two studies, including a detailed comparison of the outcomes. Refer to Study 2002-1¹ for further details regarding the basic principles of the TCLP methods used.

A letter of invitation was sent to members of the Canadian Association for Environmental Analytical Laboratories (CAEAL) and other Analytical Laboratories in January of 2004. Samples were dispatched to all participants on March 8, 2004 along with a study protocol document and instructions. All new participants were also provided a copy of the previous study report¹ and Ontario Ministry of Environment Method E9002: The Preparation of Leachates Using the Toxicity Characteristic Leaching Procedure (TCLP)². Each laboratory was assigned a confidential laboratory identification code. A list of participating laboratories is provided in Appendix 2. A copy of all correspondence is provided in Appendix 3.

1.1 STUDY INFORMATION

The target parameters for this study were trace metals which included the previous study metals as well as additional common metals that are typical to this analysis, as listed in Table 1. This design will provide additional information for the participants and the Ontario Ministry of Environment, Laboratory Services Branch (MOE-LSB).

Table 1: Study Target Analytes

Aluminum (Al)*	Copper (Cu)	Silver (Ag)*
Arsenic (As)*	Iron (Fe)	Strontium (Sr)
Barium (Ba)*	Lead (Pb)*	Titanium (Ti)
Beryllium (Be)	Magnesium (Mg)	Uranium (U)*
Cadmium (Cd)*	Manganese (Mn)	Vanadium (V)
Calcium (Ca)	Molybdenum (Mo)	Zinc (Zn)
Chromium (Cr)*	Nickel (Ni)	
Cobalt (Co)	Selenium (Se)*	

* Regulated parameters

2.0 STUDY DESIGN

The study was designed to assess the TCLP testing for the trace metals listed in Table 1. Each participant received two fortified leachates and two solid waste samples to be processed through the prescribed TCLP and analyzed for the target trace metals.

In the original study, participants were requested to follow the MOE-LSB method E9002 which is an adaptation of the US-EPA method 1311. In the study reported here, in addition to method E9002, further instructions were provided to ensure uniform application of the method by all participants. These instructions were mandatory and included:

- 1) The omission of steps that determine the choice of extraction fluid
- 2) Use of extraction fluid #2
- 3) Use of a ratio of 1:20 for waste solid/extraction fluid
- 4) Extraction for 18 ± 2 hours by tumbling at 30 rpm
- 5) Filtration using 0.7 micron acid-washed glass fibre
- 6) Preservation of final leachate at a pH less than 2

Further details may be found in the instruction sheets provided to the study participants (Appendix 3).

2.1 Leachate Sample Preparation

A dry garden soil sample was collected and stored in a plastic garbage bag at 4° C.

A leachate was prepared from this soil sample using multiple 50 g portions extracted with 1000 ml portions of leaching fluid 2 (5.7 mL glacial acetic acid per 1.0 L of reagent water to a pH of 2.88 ± 0.05) as per the study leaching process. The final filtered portions were combined in a 20 L carboy. The bulk leachate was preserved with nitric acid to a pH < 2. The entire solution was spiked to give a final metal concentration close to regulation limits (Table 2).

Half of the above solution was bottled as Leachate #1.

The remaining portion of leachate in the carboy was again spiked with selected analytes to increase the concentration to a slightly higher level. This was bottled as Leachate #2.

Spike design was at the regulation limit and slightly above, with the exception of As, which was the same in both solutions.

Table 2: Design limits for spiked leachate, MOE 04-01

Metal, mg/L	As	Cd	Cr	Pb	Se	U
Leachate # 1	3.2	0.5	5	5	1	10
Leachate # 2	3.2	0.65	6.5	6.5	1.3	13

2.2 Solid Waste Sample Preparation

The Solid Waste samples were the same as was used in Study 2002-12¹. The two samples were prepared by mixing two industrial wastes in varying amounts. Geoscience Laboratories of Sudbury, Ontario, certified to ISO 9001 standards, was contracted to perform the physical processing. The stages of processing included air drying, sieving, milling, mixing, dispensing into bottles and labeling.

2.3 Sample Distribution

Sample sets, consisting of two Leachates of approximately 250 mL in Polyethylene Terephthalate (PET) bottles, and two Solid Wastes of 110 g each, were sent by courier to the participants on

March 8, 2004. An instruction sheet and report form were electronically sent to all participants, as well as a methodology questionnaire.

3.0 STUDY RESULTS

Twenty-eight laboratories participated in this study. Individual results as they were received were transferred into an electronic spreadsheet. Preliminary tables of results were forwarded to participants on May 17, 2004 to verify the accuracy of transcription. Seven laboratories responded with requests for change. All participating laboratories submitted results electronically via e-mail. The corrected raw data are presented in Appendix 1 - Tables 13A to 16B.

4.0 STUDY EVALUATION

For each sample, the study average and standard deviation were computed for each analyte by robust techniques as described in "Statistical methods for use in proficiency testing by interlaboratory comparisons", Draft International Standard ISO/DIS 13528³. By this technique less weight is assigned to extreme results, rather than eliminating them from the data set. Results that were reported with a "less than" qualifier such as <, <MDL etc. were not included in the estimation. Only analytes for which the majority of laboratories reported positive results (i.e. greater than laboratory detection limit) were evaluated.

Z numbers were calculated as⁴:

$$Z = (\text{Result} - \text{Robust Average}) / \text{Robust standard deviation}$$

If Z is between -2 and 2, performance is satisfactory

S

If Z is between -2 and -3 or between 2 and 3, performance is questionable (Warning)

W

If Z is < -3 or > 3, performance is unsatisfactory (Corrective action recommended)

A

The evaluation findings are presented in Tables 3 to 12.

TABLE 3
LEACHATE SAMPLES: Metal Concentrations as Reported by Participants
Statistical Data

	Al	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	U	Zn
Robust Avg mg/L Robust SD mg/L RSD N	0.709	3.28	0.507	0.501	1101	4.64	0.0196	0.359	LEACH 1	22.2	4.76	110	7.04	0.0435	0.603	1.02	2.22	7.78
	0.137	0.306	0.0328	0.0511	65.4	0.479	0.00229	0.0503		1.89	0.410	8.52	0.612	0.00816	0.0714	0.122	0.211	1.08
	19.3%	9.3%	6.5%	10.2%	5.9%	10.3%	11.7%	14.0%	8.5%	8.6%	7.7%	8.7%	18.8%	11.8%	12.0%	9.5%	11.3%	9.3%
	27	27	25	27	25	27	21	26	27	27	25	26	24	25	27	26	25	26
Robust Avg mg/L Robust SD mg/L RSD N	0.712	3.33	0.510	0.642	1098	6.08	0.0196	0.360	LEACH 2	22.1	6.21	110	7.16	0.0438	0.603	1.13	2.23	7.73
	0.132	0.256	0.0296	0.0645	72.5	0.515	0.00175	0.0462		1.830	0.472	8.63	0.460	0.00641	0.0679	0.155	0.208	1.17
	18.5%	7.7%	5.8%	10.0%	6.6%	8.5%	8.9%	12.8%	8.3%	7.6%	7.9%	6.4%	14.6%	11.3%	13.7%	9.3%	9.4%	9.4%
	27	27	25	27	25	27	21	26	27	27	25	26	23	25	27	26	24	27

NOTE: Results of Lab ID 4111 were not included in the estimation of study average and standard deviation.

TABLE 4
LEACH 1: Z Scores

Lab ID	Al	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	U	Zn
4101	-0.6	1.3	-1.4	-1.1	-7.0	1.6	NE	-0.9	-0.2	1.2	-0.6	1.7	-0.2	-0.5	0.8	0.8	-4.0	1.3
4102	2.2	-2.5	-0.2	0.7	2.1	0.8	0.2	-4.8	1.1	-0.0	-0.0	1.4	0.8	0.8	-3.3	0.3	1.9	0.2
4103	0.0	-2.5	NE	0.5	-0.9	-1.0	43.9	0.8	0.4	0.8	-1.3	0.5	NE	2.0	-0.1	-3.9	NE	-0.2
4104	-0.8	0.0	1.8	-0.8	0.7	-1.0	-0.5	-0.4	-0.4	-0.9	0.6	-0.2	-0.3	-0.7	-0.3	1.2	0.4	0.4
4105	-0.2	-0.5	-2.2	-2.0	-0.3	-1.3	-5.9	-0.4	-1.8	-1.3	-1.3	-1.4	-1.0	-1.7	-0.5	-2.0	0.1	-1.2
4106	-0.4	0.0	0.4	0.1	0.5	0.3	0.2	0.2	0.7	-0.6	-1.5	-1.6	0.3	-0.0	-0.1	0.8	-0.3	-0.1
4107	2.1	0.1	0.4	-0.5	0.1	-0.6	-0.3	0.5	-0.2	-0.6	-0.4	0.3	-2.6	-0.4	-0.7	-1.3	-0.4	-0.8
4109	-0.1	-0.2	0.4	0.0	-1.5	0.0	-0.7	0.0	-0.5	0.0	-1.1	-0.5	-0.6	-0.4	-0.6	-0.4	-0.2	-0.2
4110	0.0	0.1	0.4	0.5	0.7	0.1	0.2	-0.3	1.0	-0.1	-0.0	-0.3	-1.3	0.7	0.2	-0.1	0.1	0.4
4111	-0.8	-0.3	-0.9	-0.1	2.6	1.2	0.1	0.2	2.2	1.0	-0.4	1.6	0.8	0.3	-1.1	-0.0	0.5	1.9
4113	0.1	0.1	-0.1	-0.4	-1.5	-0.3	NE	-0.0	-0.8	-0.2	-0.4	0.2	-0.3	-0.1	-0.5	-0.3	-0.1	-0.7
4116	0.7	0.8	1.2	0.9	0.6	0.3	1.0	2.2	-0.0	0.2	0.1	-0.2	0.2	0.5	0.4	0.5	1.5	-0.8
4117	-0.6	1.0	0.8	0.0	-1.2	0.8	2.1	0.3	0.4	-0.0	-0.6	-0.1	0.6	-0.1	2.1	0.5	0.0	-0.7
4118	-1.0	-1.2	NE	-1.1	0.6	-1.5	-1.1	-1.0	-1.5	-2.9	-0.7	-0.2	-0.8	-1.9	-0.7	2.5	-0.9	-2.7
4119	1.6	0.6	0.1	-0.7	-0.3	-0.2	-0.3	0.5	-0.4	-0.2	-0.2	0.7	4.7	-0.3	0.0	-0.4	-1.1	0.0
4120	0.7	0.4	0.6	-0.2	0.6	1.0	0.2	0.2	0.4	0.0	1.0	0.8	0.7	0.6	-0.5	0.6	0.3	1.4
4121	-2.1	0.4	0.4	-0.0	-0.0	0.3	NE	14.9	1.0	0.6	1.2	1.4	NE	NE	-0.4	-0.1	-0.5	2.8
4122	-0.3	0.7	-0.2	1.9	NE	1.2	NE	-1.1	0.9	0.8	NE	0.4	-0.8	1.4	0.7	-0.8	1.3	1.0
4124	-1.3	-1.0	-1.1	0.9	0.7	0.3	NE	1.3	0.5	1.8	1.0	-2.6	25.3	-0.3	5.5	0.1	-0.9	0.2
4125	-0.2	-0.3	-0.2	-0.0	-0.0	0.7	0.2	-1.1	1.1	0.6	-0.0	-0.7	-0.4	-0.0	-0.1	-1.0	-0.9	-1.1
4126	3.9	-1.0	-2.0	-3.0	-1.4	-2.0	NE	NE	-3.1	-2.4	-1.1	0.6	NE	NE	-0.2	-1.3	-0.6	NE
4130	-0.3	-1.1	0.5	0.5	-0.0	-0.5	-0.7	0.9	-1.0	-0.8	0.5	-0.1	0.4	-0.4	6.4	-0.7	-0.7	0.9
4133	0.1	1.0	-0.6	0.2	0.6	0.4	-4.2	0.3	0.3	-0.3	0.9	NE	0.8	1.1	-2.8	0.4	9.1	-0.2
4136	1.0	2.7	0.1	1.4	0.6	0.4	1.1	1.6	0.6	1.2	1.3	0.8	0.8	0.8	1.5	1.1	0.4	0.6
4137	0.4	0.1	0.1	0.4	-0.0	-0.1	-0.7	0.3	-0.6	-0.1	0.7	-0.1	-0.2	-1.3	0.7	0.8	0.1	-0.2
4138	-3.6	-0.1	-5.7	-2.2	NE	-4.0	0.2	-1.3	-5.0	-4.2	NE	-0.8	-4.1	-3.4	-1.4	NE	NE	-3.3
4139	0.1	-1.0	0.0	0.4	1.2	-0.2	0.6	0.3	1.3	0.4	2.1	0.4	0.3	0.2	-0.3	-0.1	-0.3	0.0
4140	-0.1	1.4	1.6	1.5	0.1	1.4	0.6	0.3	0.4	2.3	0.3	-4.6	1.0	1.1	0.7	0.8	2.2	1.0

NE = Not Evaluated

TABLE 5
LEACH I: Performance Summary
S = Satisfactory W = Warning A = Corrective Action Recommended
NE = Not Evaluated

LAB ID	Al	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	U	Zn
4101	S	S	S	S	A	S	NE	S	S	S	S	S	S	S	S	S	A	S
4102	W	W	S	S	W	S	S	A	S	S	S	S	NE	S	A	S	NE	S
4103	S	S	NE	S	S	S	A	S	S	S	S	S	S	S	S	S	S	S
4104	S	S	W	S	S	S	A	S	S	S	S	S	S	S	S	S	S	S
4105	S	S	S	S	S	S	S	S	S	S	S	S	W	S	S	S	S	S
4106	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4107	W	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4109	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4110	S	S	S	S	W	S	S	S	W	S	S	S	S	S	S	S	S	S
4111	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4113	S	S	S	S	S	S	NE	S	S	S	S	S	S	S	S	S	S	S
4116	S	S	S	S	S	S	S	W	S	S	S	S	S	S	S	S	S	S
4117	S	S	S	S	S	S	S	S	S	S	S	S	S	S	W	S	S	S
4118	S	S	NE	S	S	S	S	S	S	S	S	S	S	S	S	W	S	W
4119	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4120	S	S	S	S	S	S	S	S	S	S	S	S	A	S	S	S	S	S
4121	W	S	S	S	S	S	NE	A	S	S	NE	S	NE	S	S	S	S	W
4122	S	S	S	S	NE	S	NE	S	S	S	S	S	S	S	S	S	S	S
4124	S	S	S	S	NE	S	NE	S	S	S	S	S	A	S	S	S	S	S
4125	S	S	S	S	NE	S	NE	S	S	S	S	S	S	S	A	S	S	S
4126	A	S	S	S	S	W	S	NE	A	W	S	S	NE	S	A	S	S	NE
4130	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4133	S	S	S	S	S	S	A	S	S	S	S	NE	S	S	W	S	A	S
4136	S	W	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4137	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4138	A	S	A	W	NE	A	S	S	A	A	NE	S	A	A	S	NE	NE	S
4139	S	S	S	S	S	S	S	S	S	S	W	S	S	S	S	S	S	A
4140	S	S	S	S	S	S	S	S	S	W	S	A	S	S	S	S	W	S

TABLE 6
LEACH 2: Z Scores

LAB ID	Al	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	U	Zn
4101	-0.6	1.1	-1.4	-0.8	-6.2	1.2	NE	-1.1	0.1	1.0	-0.5	1.2	-0.3	-0.6	0.6	1.0	-5.0	1.2
4102	1.3	-2.6	-0.3	0.6	1.3	0.6	0.2	-5.6	1.0	-0.2	0.1	1.3	1.0	0.5	-3.3	0.3	1.7	0.1
4103	0.0	-3.2	NE	0.0	-0.8	-1.1	57.4	0.7	0.4	0.5	-1.2	0.4	NE	2.1	-2.1	-4.0	NE	-0.1
4104	-1.1	-0.3	1.7	-0.9	1.0	0.3	-1.0	-0.8	-0.0	0.4	0.7	-0.1	-0.6	-0.8	-0.5	1.0	0.6	0.8
4105	-0.2	-0.6	-2.6	-1.9	-0.2	-1.5	-8.4	-0.4	-1.8	-1.6	-1.2	0.2	-1.2	-1.8	-0.1	-2.0	0.3	-1.1
4106	-0.3	-0.3	0.4	0.1	0.3	0.1	-0.4	0.1	0.5	0.1	-1.2	-2.4	0.5	-0.0	-0.2	0.6	-0.4	-0.1
4107	2.2	-0.3	0.3	-0.6	0.4	0.1	-0.9	0.6	-0.1	-0.9	-0.4	0.2	-3.4	-0.2	-0.7	-1.4	-0.5	-0.9
4109	0.1	0.1	0.7	0.4	-0.9	0.4	0.2	0.2	-0.1	0.3	-0.8	-0.8	1.0	0.4	-0.3	0.0	0.2	0.3
4110	-0.3	0.3	0.0	1.0	0.7	0.0	0.1	0.0	1.0	-0.0	0.0	-0.8	-1.7	0.8	0.4	-0.1	0.3	0.6
4111	-0.9	-0.5	-1.4	-0.1	2.7	1.7	0.8	0.1	2.2	0.9	-0.4	1.8	-0.6	0.2	-1.2	0.0	-0.1	1.9
4113	0.1	-0.2	-0.2	-0.4	-1.4	-0.5	NE	-0.2	-0.9	-0.4	-0.4	0.3	-0.1	-0.2	-0.6	-0.4	-0.3	-0.8
4116	0.5	0.8	1.3	0.9	0.3	0.4	1.0	2.3	-0.0	0.1	0.1	0.0	0.2	0.6	0.2	0.5	1.8	-0.8
4117	-1.9	0.9	0.6	0.1	-1.1	0.6	2.2	0.1	0.3	-0.2	-0.6	-3.7	0.7	-0.1	1.8	0.5	0.1	-0.6
4118	-1.1	-1.3	NE	-1.1	0.6	-2.0	-0.9	-1.1	-1.6	-3.4	-0.6	-0.5	-0.9	-2.1	-0.8	2.5	-0.7	-2.6
4119	2.1	0.6	0.1	-0.7	1.3	-0.3	-0.4	0.5	-0.3	-0.4	-0.2	0.7	0.2	-0.4	0.1	-0.4	-0.1	0.1
4120	0.7	0.4	0.7	-0.1	-0.2	0.6	0.6	0.0	0.5	0.6	1.0	1.7	0.5	0.6	-0.5	0.6	0.1	0.9
4121	-0.6	0.7	0.7	0.9	0.0	0.6	NE	0.9	1.0	0.2	1.2	1.1	NE	NE	-0.1	-0.6	-0.4	1.9
4122	-0.1	0.3	-0.3	0.9	NE	1.4	NE	-1.3	0.9	0.8	NE	0.2	-0.0	-0.0	1.2	-0.5	NE	1.1
4124	-1.0	1.3	-1.0	1.2	1.0	0.6	NE	1.1	0.9	1.9	1.4	0.1	-6.8	0.4	3.6	0.3	-0.9	0.6
4125	-0.5	-0.9	-0.3	-0.7	-1.3	-0.2	0.2	-1.3	0.8	-0.4	-1.1	-0.9	-0.6	-0.0	-0.8	-1.1	-1.3	-1.0
4126	3.7	-0.1	-2.3	-2.9	-1.1	-2.3	NE	NE	-3.0	-2.7	-1.0	1.0	NE	NE	0.2	-1.3	-1.2	-1.2
4130	-0.3	-1.3	0.7	0.4	0.0	-0.8	-0.9	1.1	-1.0	0.9	0.5	-0.3	1.1	-0.4	3.9	-0.8	-0.6	1.0
4133	0.6	-0.1	-0.6	0.1	0.7	0.3	0.2	0.2	0.4	-0.4	0.9	NE	1.0	1.7	0.1	0.8	4.3	-0.2
4136	0.9	3.1	-0.1	1.3	0.6	1.0	0.8	1.7	0.2	1.3	1.3	0.8	0.5	0.8	1.2	1.2	0.7	1.0
4137	0.5	0.3	0.0	0.3	0.0	-0.3	-2.1	0.2	-0.6	-0.2	0.5	-0.3	-0.1	-1.4	0.5	0.8	0.4	-0.2
4138	-3.7	0.2	-6.1	-2.0	NE	-4.6	0.2	-1.3	-4.9	-4.5	NE	-0.9	-5.3	-3.3	-1.5	NE	NE	-3.1
4139	0.3	-1.3	0.3	0.6	0.9	-0.3	0.8	0.2	1.9	0.3	2.1	-0.1	0.3	0.4	-0.5	0.1	-0.1	0.0
4140	-0.3	1.1	1.4	1.2	-0.5	1.4	0.2	0.2	-0.6	1.9	-0.1	-6.0	1.3	1.1	0.5	0.3	2.1	0.8

NE = Not Evaluated

TABLE 7
LEACH 2: Performance Summary
W Warning A Corrective Action Recommended
S Satisfactory NE = Not Evaluated

LAB ID	Al	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	U	Zn
4101	S	S	S	S	A	S	NE	S	S	S	S	S	S	S	S	S	A	S
4102	S	W	S	S	S	S	S	A	S	S	S	S	NE	S	W	S	NE	S
4103	S	A	NE	S	S	S	A	S	S	S	S	S	S	W	S	A	S	S
4104	S	S	W	S	S	S	A	S	S	S	S	S	S	S	S	W	S	S
4105	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4106	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4107	W	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4109	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4110	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4111	S	S	S	S	W	S	NE	S	W	S	S	S	S	S	S	S	S	S
4113	S	S	S	S	S	S	S	W	S	S	S	S	S	S	S	S	S	S
4116	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4117	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4118	S	S	NE	S	S	S	S	S	S	S	S	A	S	W	S	W	S	W
4119	W	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4120	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4121	S	S	S	S	S	S	NE	S	S	S	NE	S	S	NE	S	S	NE	S
4122	S	S	S	S	NE	S	NE	S	S	S	NE	S	S	S	S	S	S	S
4124	S	S	S	S	S	S	NE	S	S	S	S	S	S	S	S	S	S	S
4125	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4126	A	S	W	W	S	W	NE	NE	W	W	S	S	S	S	A	S	S	S
4130	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
4133	S	S	S	S	S	S	S	S	S	S	S	S	S	S	A	S	S	S
4136	S	A	S	S	S	S	S	S	S	S	S	NE	S	S	S	S	S	S
4137	S	S	S	S	S	S	W	S	S	S	S	S	S	S	S	S	S	S
4138	A	S	A	W	NE	A	S	S	A	A	NE	S	A	A	S	NE	NE	A
4139	S	S	S	S	S	S	S	S	S	S	W	S	S	S	S	S	S	S
4140	S	S	S	S	S	S	S	S	S	S	S	A	S	S	S	S	W	S

TABLE 8
WASTE 1 and WASTE 2: Metal Concentration as Reported by Participants
Statistical Data

	Ba	Ca	Cd	Cr	Cu	Fe WASTE 1	Mg	Mn	Mo	Pb	Sr	Zn
Robust Avg	0.346	1819	0.625	0.186	0.0233	0.775	88.7	0.425	0.164	0.292	1.02	27.3
mg/L Robust												
SD	0.0806	194	0.500	0.0902	0.0181	1.41	18.9	0.402	0.165	0.245	0.148	27.3
mg/L												
RSD	23.3%	10.7%	80.0%	48.5%	77.7%	181.9%	21.3%	94.6%	100.6%	83.9%	14.5%	100.0%
N	24	25	24	26	19	15	25	24	23	24	26	26
						WASTE 2						
Robust	0.448	1786	1.69	0.125	0.0395	0.661	104	1.95	0.0526	0.971	1.02	98.5
Avg												
mg/L												
Robust	0.0994	200	0.720	0.0692	0.0266	1.13	22.2	0.844	0.0397	0.605	0.135	87.6
SD												
mg/L												
RSD	22.2%	11.2%	42.6%	55.4%	67.3%	171.0%	21.3%	43.3%	75.5%	62.3%	13.2%	88.9%
N	25	25	25	25	19	17	25	25	21	26	26	26

WASTE 1: Z Scores

LAB ID	Ba	Ca	Cd	Cr	Cu	Fe	Mg	Mn	Mo	Pb	Sr	Zn
4101	-2.7	-7.7	NE	8.7	NE	0.0	NE	NE	13.4	-0.8	-4.2	-1
4102	-0.6	0.1	-1.2	1.9	NE	NE	-0.6	-1.0	1.1	NE	-1.1	-1
4103	NE	-1.5	-1.2	1.1	1.8	-0.4	-2.1	-1	3.7	-0.3	-0.9	-1
4104	0.1	1.1	0.1	-0.7	-1.2	NE	-0.1	-0.4	-0.6	-0.1	0.9	0.3
4105	-0.9	-1.3	-0.9	-0.0	-1.0	-0.5	-0.3	-0.7	-0.3	-0.9	-1.2	-0.8
4106	5.9	0.1	0.0	-0.4	0.9	1.3	-0.7	-0.1	-0.5	-1.1	0.7	0
4107	0.5	0.3	0.5	-0.4	1.5	0.9	0.7	1.2	-0.8	0.5	-0.5	0.9
4109	0.4	-0.8	0.5	-0.6	-0.5	NE	-0.3	0.3	-0.6	0.5	-0.1	0.4
4110	1.2	0.4	-0.4	0.0	-0.3	NE	-0.4	-0.7	-0.3	0.5	0.5	-0.5
4111	-2.3	-5.8	-1.2	9.5	NE	0.5	-4.7	NE	11.7	-1.2	-3.9	1.0
4113	2.2	1.1	6.7	-1.1	7.0	NE	2.3	11.3	NE	15.3	0.9	30.3
4116	-0.2	0.3	-0.1	-0.4	0.1	-0.5	-0.3	-0.4	-0.6	-0.0	0.2	-0.3
4117	0.1	-1.3	-0.6	0.1	NE	-0.5	-0.5	-0.8	-0.3	-0.8	0.7	-0.7
4118	NE	2.6	2.6	-1.2	0.5	NE	3.7	3.6	-0.8	1.9	3.2	7
4119	-1.6	-2.5	NE	6.1	NE	NE	-3.4	NE	10.2	NE	-2.3	NE
4120	0.3	0.1	1.1	-0.5	-0.3	-0.3	1.4	1.3	-0.7	1.0	1.4	1.4
4121	5.6	-0.5	-0.1	0.2	NE	3.8	-0.5	0.8	NE	1.2	-0.8	0.1
4122	-0.6	NE	0.8	-1.0	NE	-0.5	NE	0.6	-0.7	0.8	-0.5	0.8
4124	NE	0.8	1.0	NE	NE	NE	0.4	0.3	NE	1.0	0.4	0.8
4125	-0.6	0.4	-0.9	0.2	NE	0.4	-0.0	-0.8	0.2	-0.8	-0.1	-0.8
4126	-0.1	-0.3	NE	0.5	NE	NE	-0.9	NE	NE	NE	-0.4	-0.9
4130	0.0	0.8	0.8	-1.0	-0.6	NE	0.8	1.6	-0.7	0.6	-0.6	1.2
4133	-0.7	0.2	-0.7	0.2	-0.4	-0.5	0.7	-0.2	1.8	-1.0	0.5	-0.7
4136	0.3	0.5	-1.1	2.0	-0.5	-0.4	0.8	-0.9	0.9	1.0	1.0	-0.9
4137	0.3	0.4	-0.9	0.7	0.1	NE	0.1	-0.9	0.1	-0.8	0.5	-0.8
4138	-2.2	NE	0.0	-1.5	-0.7	NE	-2.2	-0.2	-0.8	-0.4	NE	0.8
4139	0.2	0.6	0.7	-0.2	-0.5	3.1	0.8	0	-0.6	0.6	0.8	0.4
4140	0.2	-0.1	-0.6	0.3	NE	NE	0.2	-0.7	-0.2	-1.1	-0.1	-0.7

NE = Not Evaluated

TABLE 10

WASTE 1: Performance Summary
W = Warning A = Corrective Action Recommended
NE = Not Evaluated

LAB ID	Ba	Ca	Cd	Cr	Cu	Fe	Mg	Mn	Mo	Pb	Sr	Zn
4101	W	A	NE	A	NE	S	NE	NE	A	S	A	S
4102	S	S	S	S	NE	NE	S	S	S	NE	S	S
4103	NE	S	S	S	S	S	W	S	A	S	S	S
4104	S	S	S	S	S	NE	S	S	S	S	S	S
4105	S	S	S	S	S	S	S	S	S	S	S	S
4106	A	S	S	S	S	S	S	S	S	S	S	S
4107	S	S	S	S	S	S	S	S	S	S	S	S
4109	S	S	S	S	S	NE	S	S	S	S	S	S
4110	S	S	S	S	S	NE	S	S	S	S	S	S
4111	W	A	S	A	NE	S	A	NE	A	S	A	A
4113	W	S	A	S	A	NE	W	A	NE	A	S	S
4116	S	S	S	S	NE	S	S	S	S	S	S	S
4117	S	S	S	S	NE	S	S	S	S	S	S	S
4118	NE	W	W	S	S	NE	A	A	S	NE	A	A
4119	S	W	NE	A	NE	NE	A	NE	A	NE	W	NE
4120	S	S	S	S	S	S	S	S	S	S	S	S
4121	A	S	S	S	NE	A	S	S	NE	S	S	S
4122	S	NE	S	S	NE	S	NE	S	NE	S	S	S
4124	NE	S	S	NE	NE	NE	S	S	NE	S	S	S
4125	S	S	S	S	NE	NE	S	S	NE	S	S	S
4126	S	S	NE	S	NE	NE	S	NE	NE	NE	S	S
4130	S	S	S	S	NE	NE	S	S	S	S	S	S
4133	S	S	S	S	S	S	S	S	S	S	S	S
4136	S	S	S	S	S	S	S	S	S	S	S	S
4137	S	S	S	W	S	NE	S	S	S	S	S	S
4138	W	NE	S	S	S	NE	W	S	S	S	NE	S
4139	S	S	S	S	S	A	S	S	S	S	S	S
4140	S	S	S	S	NE	NE	S	S	S	S	S	S

TABLE 11
WASTE 2: Z Scores

LAB ID	Ba	Ca	Cd	Cr	Cu	Fe	Mg	Mn	Mo	Pb	Sr	Zn
4101	-3.2	-7.5	NE	9.7	NE	8.0	NE	NE	49.8	-1.3	-5.0	-1.1
4102	-0.5	0.5	-0.2	-0.1	NE	NE	-0.2	-0.3	-0.6	-0.6	-0.7	-0.4
4103	NE	-1.1	-2.1	1.2	30.5	0.5	-1.6	-2.2	NE	-1.2	-1.0	-1.1
4104	-0.3	1.4	0.1	-0.6	-0.9	NE	-0.6	-1.0	0.6	0.3	0.2	0.3
4105	-0.1	-2.3	1.1	-1.1	0.7	-1.6	-0.3	2.9	-0.8	2.8	-1.9	2.7
4106	4.2	0.0	-0.2	-0.4	1.8	-0.9	-1.0	0.1	-0.3	-0.2	0.4	-0.1
4107	0.4	0.6	-0.3	-0.0	0.4	-0.6	0.7	0.4	-0.8	-0.1	-0.6	-0.1
4109	0.1	-1.3	0.2	-0.5	-0.6	NE	-0.9	0.0	-0.6	0.3	-0.7	0.1
4110	1.6	0.4	0.2	0.0	-0.3	NE	-0.2	-0.2	-0.1	0.1	0.5	-0.0
4111	-2.7	-5.4	-2.3	11.4	NE	0.6	-4.7	NE	50.3	-1.6	-4.3	-1.1
4113	2.9	0.4	4.1	-0.6	6.1	NE	1.3	4.8	NE	7.3	0.4	10.7
4116	-0.0	0.2	-0.2	-0.4	0.3	-0.9	-0.0	-0.2	-0.4	-0.2	0.3	-0.4
4117	0.0	-1.1	-0.3	-0.3	-0.8	-0.8	-0.6	-0.8	0.8	-0.5	1.0	-0.6
4118	NE	1.9	1.8	-0.9	0.9	-1.4	2.0	2.1	-0.8	1.6	2.5	4.3
4119	-2.0	-2.9	NE	5.5	NE	NE	-2.8	NE	27.6	NE	-2.6	NE
4120	0.5	0.3	0.9	-0.3	0.1	-0.9	0.6	1.1	-0.5	1.5	1.1	1.0
4121	2.7	0.8	-0.4	0.9	NE	0.2	1.2	-0.1	NE	-0.6	-0.1	-0.2
4122	-0.5	NE	0.7	-0.4	NE	-0.9	NE	0.2	-0.6	0.9	-0.6	0.5
4124	0.4	0.8	1.4	NE	NE	-0.6	0.3	0.4	NE	0.8	0.3	1.1
4125	-0.5	0.1	-0.7	-0.4	NE	-0.9	-0.2	-0.4	NE	-0.3	0.6	-0.6
4126	-0.3	-0.5	-0.8	NE	NE	NE	-1.1	-0.2	NE	-0.4	-0.5	-0.4
4130	-0.1	0.2	1.3	-0.9	-0.0	-1.4	-0.1	1.2	-0.8	1.0	-1.1	1.7
4133	-1.1	0.2	-0.8	88.2	-0.7	77.5	0.5	0.6	10.3	-0.6	0.6	-0.6
4136	-0.3	0.5	-1.7	1.6	-0.7	0.8	1.3	-1.5	2.2	-1.1	1.0	-1.0
4137	0.0	0.1	-0.7	-0.1	-0.2	NE	-0.1	-1.0	-0.2	-0.5	0.6	-0.6
4138	-2.4	NE	-0.7	-1.2	-1.1	NE	-0.4	-0.9	-0.8	-0.8	NE	0.4
4139	0.2	0.8	-0.4	0.1	-1.0	-0.5	1.3	-0.0	0.1	-0.4	0.8	-1.1
4140	0.3	-0.4	-0.1	-0.2	-0.6	NE	-0.0	-0.3	-0.2	-0.6	-0.3	-1.0

NE = Not Evaluated

TABLE 12

WASTE 2: Performance Summary

W = Warning A = Corrective Action Recommended
NE = Not Evaluated

LAB ID	Ba	Ca	Cd	Cr	Cu	Fe	Mg	Mn	Mo	Pb	Sr	Zn
4101	A	A	NE	A	NE	S	NE	NE	A	S	A	S
4102	S	S	S	S	NE	NE	S	S	S	S	S	S
4103	NE	S	W	S	A	S	S	W	NE	S	S	S
4104	S	S	S	S	S	NE	S	W	S	W	S	W
4105	S	W	S	S	S	S	S	S	S	S	S	S
4106	A	S	S	S	S	S	S	S	S	S	S	S
4107	S	S	S	S	S	S	S	S	S	S	S	S
4109	S	S	S	S	S	NE	S	S	S	S	S	S
4110	S	S	S	S	S	NE	S	S	S	S	S	S
4111	W	A	W	S	NE	S	A	NE	A	S	A	S
4113	W	S	A	S	A	NE	S	A	NE	S	S	A
4116	S	S	S	S	S	S	S	S	S	S	S	S
4117	S	S	S	S	S	S	S	S	S	S	S	S
4118	NE	S	S	S	S	S	W	W	S	S	W	A
4119	W	W	S	A	NE	NE	W	NE	A	NE	W	A
4120	S	S	S	S	S	S	S	S	S	S	S	S
4121	W	S	S	S	NE	NE	W	NE	S	NE	W	NE
4122	S	NE	S	S	NE	S	S	S	NE	S	S	S
4124	S	S	S	NE	NE	S	NE	S	NE	S	S	S
4125	S	S	S	S	NE	S	S	S	NE	S	S	S
4126	S	S	S	NE	NE	NE	S	S	NE	S	S	S
4130	S	S	S	S	S	NE	S	S	NE	S	S	S
4133	S	S	S	A	S	S	S	S	A	S	S	S
4136	S	S	S	S	S	S	S	S	W	S	S	S
4137	S	S	S	S	S	NE	S	S	S	S	S	S
4138	W	NE	S	S	S	NE	S	S	S	S	NE	S
4139	S	S	S	S	S	A	S	S	S	S	S	S
4140	S	S	S	S	S	NE	S	S	S	S	S	S

5.0 DISCUSSION

At present, a comparison of the two studies is being undertaken and it is proposed to present these findings in a third report which will also discuss implications to regulatory requirements.

6.0 BIBLIOGRAPHY

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3. Statistical methods for use in proficiency testing by Interlaboratory Comparisons, Draft International Standard ISO/DIS 13528, 2002.
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**APPENDIX 1 - RAW DATA
(AS CONFIRMED BY PARTICIPANTS)**

TABLE 13 A
RAW DATA - LEACH I

LAB ID	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb
	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.
4101	0.62	3.67	0.462	0	<0.05	0.444	5.39	0	<0.05	21.8	5.25
4102	1.01	2.51	0.5	0.005	<MDL	0.537	5.01	0.02	0.11	24.28	4.75
4103	0.714	2.5	MDL = 1.0	MDL = 0.001	MDL = 0.529	1041	4.15	0.12	0.391	22.9	5.1
4104	0.597	0.009	3.29	0.003	0.586	0.001	0.0002	<0.000	0.461	0.0007	2 @ 250X
											2 @ 250X
											5X dil.
4105	0.68	3.14	0.434	0	<0.001	0.401	4.04	0.006	0.333	18.8	4.21
4105	0.68	3.14	0.434	0	<0.001	0.401	4.04	0.006	0.333	18.8	4.21
4106	0.655	3.28	0.519	0.005	<0.005	0.506	4.78	0.02	0.362	23.5	4.86
4107	1	3.31	0.519	0.005	MDL = 0.473	1109	4.35	0.019	0.378	21.87	4.52
4109	0.7	3.23	0.52	0.01	< 0.501	1000	4.65	0.018	0.354	21.2	4.78
4110	0.709	3.3	0.52	0.001	<MDL	0.525	4.7	0.0201	0.34	24	4.7
4111	0.594	3.19	0.4769	0.0005	<MDL	0.498	5.24	0.01979	0.365	26.3	5.18
4113	0.72	3.3	0.503	0.01	<MDL	0.483	4.51	0.0218	0.352	20.7	4.69
4116	0.8	3.52	0.546	0.0005	<MDL	0.546	4.81	0.0244	0.366	22.1	4.85
4117	0.6201	3.57	0.5334	0.01	< 0.5023	1025	5.047	0.017	0.305	23.03	4.747
4118	0.566	2.9	1	< 0.001	< 0.447	1140	3.91	0.019	0.379	19.3	3.57
4119	0.93	3.46	0.511	0.0004	<MDL	0.465	4.57	0.0201	0.361	21.5	4.67
4120	0.8	3.41	0.528	0.001	<MDL	0.493	5.12	0.0201	0.361	23	4.77
4121	0.42	3.4	0.52	0.14	<0.14	0.5	4.8	0.1	<0.1	24	5
4122	0.673	3.5	0.5	0.1	<0.1	0.6	5.2	0.1	<0.1	23.9	5.1
4124	0.53	2.98	0.47	0.1	<MDL	0.546	4.8	0.2	<RDL	23.2	5.48
4125	0.68	3.2	0.47	0.001	<MDL	0.5	5	0.02	0.3	24.3	5
4126	1.25	2.9652	0.442	0.001	<MDL	0.347	3.68			16.3	3.77
4130	0.673	2.935	0.525	0.001	<MDL	0.525	4.42	0.018	0.399	20.3	4.43
4133	20	84	50	2	<MDL	14	32760	0.018	0.5	460	114
4136	0.84	4.1	0.511	0.001	<MDL	0.573	116	0.018	0.399	26	4.60
4137	0.77	3.3	0.51	0.001	<MDL	0.52	4.82	0.022	0.432	23.3	5.26
4138	0.21	3.25	0.32	0.001	<MDL	0.52	4.6	0.018	0.37	21	4.7
4139	0.723	2.96	0.508	0.004	<MDL	0.52	2.75	0.02	0.29	12.7	3.02
4140	0.69	3.7	0.56	0.02	<EQL	0.58	4.54	0.021	0.368	24.6	4.92
							5.3	0.021	0.37	23	5.7

TABLE 13 B
RAW DATA - LEACH I

LAB ID	Mg		Mn		Mo		Ni		Se		Ag		Sr		Ti		U		V		Zn	
	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.
4101	105	8.07	8.07	0.042	0.05	0.042	0.566	0.66	1.11	0.616	0.005	0	2.4	2.288	0	0.005	5.25	11.6	0	0.02	8.72	8.72
4102	110	7.87	7.87	0.05	MDL = 0.5	0.05	0.66	0.745	1	1	MDL = 0.001	MDL = 0.001	1.395	1.395	MDL = 1	MDL = 1	MDL = 1	MDL = 1	MDL = 0.5	MDL = 0.5	7.67	7.67
4103	99.2	7.35	7.35	MDL = 0.5	0.001	0.001	0.552	0.0007	0.979	0.008	0.004	<0.004	2.47	2.47	0.001	0.001	10	0.1@10X	0.0008	<0.0008	8.09	8.09 @ 5X dil.
4104	115.07 @ 10X																					
4105	99.2	6.04	6.04	0.035	0.035	0.035	0.48	0.48	0.95	0.95	0	<0.005	1.8	1.8	0	<0.005	9.7	9.7	0	<0.005	6.89	6.89
4106	99.2	6.04	6.04	0.035	0.035	0.035	0.48	0.48	0.95	0.95	0	<0.005	1.8	1.8	0	<0.005	9.7	9.7	0	<0.005	6.89	6.89
4107	97.2	7.25	7.25	0.046	0.046	0.046	0.602	0.602	1	1	0.001	<0.001	2.39	2.39	0.01	<0.01	9.23	9.23	0.005	<0.005	7.69	7.69
4108	107	6.76	6.76	0.022	0.022	0.022	0.573	0.573	0.935	0.935	0.016	0.016	1.949	1.949	0.01	0.01	9.15	9.15	0.005	0.005	7.17	7.17
4109	101	7	7	0.04	0.04	0.04	0.6	0.6	0.94	0.94	0.001	<0.001	2.14	2.14	0.05	<0.05	9.36	9.36	0.005	<0.005	7.67	7.67
4110	110	6.9	6.9	0.033	0.033	0.033	0.65	0.65	1.04	1.04	0.001	<0.001	2.2	2.2	0.0073	0.0073	9.5	9.5	0.0021	0.0021	8.1	8.1
4111	106.65	7.99	7.99	0.037	0.037	0.037	0.624	0.624	0.882	0.882	0.0089	0.0089	2.23	2.23	0.001	<0.001	10.19	10.19	0.001	<0.001	9.13	9.13
4113	107	6.85	6.85	0.041	0.041	0.041	0.596	0.596	0.957	0.957	0.02	<0.02	2.15	2.15	0.01	<0.01	9.45	9.45	0.03	<0.03	7.26	7.26
4115	111	7.16	7.16	0.045	0.045	0.045	0.642	0.642	1.06	1.06	0.01	<0.01	2.33	2.33	0.004	<0.004	11.2	11.2	0.001	<0.001	7.2	7.2
4117	105.4	7.279	7.279	0.0481	0.0481	0.0481	0.5967	0.5967	1.274	1.274	0.0367	0.0367	2.326	2.326	0.006	<0.006	9.646	9.646	0.05	<0.05	7.307	7.307
4118	104	5.47	5.47	0.037	0.037	0.037	0.464	0.464	0.93	0.93	0.01	<0.01	2.75	2.75	0.01	<0.01	8.6	8.6	0.005	<0.005	5.86	5.86
4119	108	6.91	6.91	0.082	0.082	0.082	0.579	0.579	1.02	1.02	0.001	<0.001	2.34	2.34	0.005	<0.005	9.95	9.95	0.001	<0.001	8.81	8.81
4120	119	7.48	7.48	0.0491	0.0491	0.0491	0.646	0.646	0.951	0.951	0.06	<0.06	2.2	2.2	0.2	<0.2	9.1	9.1	0.1	<0.1	9.8	9.8
4121	120	6.9	6.9	0.14	<0.14	0.14	<0.14	<0.14	1.1	1.1	0.1	<0.1	2.05	2.05	0.001	<0.001	11	11	0.1	<0.1	8.5	8.5
4122	119	6.597	6.597	0.0367	0.0367	0.0367	0.7	0.7	1.1	1.1	0.1	<0.1	2.25	2.25	0.2	<0.2	8.6	8.6	0.1	<0.1	7.93	7.93
4124	119	7.43	7.43	0.04	0.04	0.04	0.58	0.58	1.69	1.69	0.001	<0.001	2	2	0.05	<0.05	8.6	8.6	0.04	<0.04	7	7
4125	110	7	7	0.04	0.04	0.04	0.6	0.6	1	1	0.001	<0.001	1.94	1.94	0.05	<0.05	8.91	8.91	0.02	<0.02	8.46	8.46
4126	101	5.72	5.72	<MDL	<MDL	<MDL	0.454	<MDL	0.9865	0.9865	0.01	<0.01	2.07	2.07	0.02	<0.02	8.89	8.89	0.02	<0.02	224.5	224.5
4130	114	7.55	7.55	0.047	0.047	0.047	0.574	0.574	1.8	1.8	0.5	<0.5	54	54	1	<1	290	290	1	<1	8.24	8.24
4133	2100	179	179	4	4	4	17	17	26	26	0.002	<0.002	2.45	2.45	0.002	<0.002	9.98	9.98	0.001	<0.001	8.24	8.24
4136	121	7.56	7.56	0.05	0.05	0.05	0.66	0.66	1.2	1.2	0.011	0.011	2.4	2.4	0.002	<0.002	9.7	9.7	0.003	<0.003	7.6	7.6
4137	116	7	7	0.042	0.042	0.042	0.51	0.51	1.1	1.1	0.03	0.03	ND	ND	0.006	<0.006	9.31	9.31	<0.01	<0.01	5.38	5.38
4138	ND	4.23	4.23	0.01	0.01	0.01	0.36	0.36	0.84	0.84	0.002	<0.002	2.21	2.21	0.02	<0.02	12	12	0.02	<0.02	8.5	8.5
4139	128	6.52	6.52	0.046	0.046	0.046	0.62	0.62	0.977	0.977	0.005	<0.005	2.4	2.4	0.02	<0.02	12	12	0.02	<0.02	8.5	8.5
4140	113	7.3	7.3	0.052	0.052	0.052	0.68	0.68	1.1	1.1	0.005	<0.005	2.4	2.4	0.02	<0.02	12	12	0.02	<0.02	8.5	8.5

TABLE 14 A
RAW DATA - LEACH 2
mg/L

LAB ID	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb
	Res.	Qual.	Res.	Qual.	Res.	Res.	Qual.	Res.	Qual.	Res.	Qual.
4101	0.63	3.61	0.47	0	0.59	650	6.7	0	0.311	22.3	6.69
4102	0.89	2.66	0.5	0.005	<MDL	1193	6.37	0.02	<0.05	23.88	6.11
4103	0.714	2.5	MDL = 1.0	MDL = 0.001	0.645	1041	5.52	0.12	0.391	22.9	6.43
4104	0.57	0.009	0.325	0.003	0.581	1170	2 @ 250X	0.005 @ 5X	0.0008	22.1 @ 5X	6.38 @ 5X
4105	0.682	3.17	0.434	0	0.517	1080	5.31	0.005	0.341	18.8	5.47
4106	0.682	3.17	0.434	0	0.517	1080	5.31	0.005	0.341	18.8	5.47
4107	0.677	3.24	0.522	0.005	0.649	1117	6.13	0.019	0.364	23	6.24
4107	1	3.26	0.519	0.005	0.601	1130	6.11	0.018	0.387	22	5.77
4109	0.72	3.36	0.53	0.01	<0.668	1030	6.29	0.02	0.367	22	6.35
4110	0.675	3.4	0.51	0.001	<MDL	1150	6.1	0.0198	0.36	24	6.2
4111	0.589	3.2	0.47	0.0005	0.704	1285	6.97	0.021	0.366	26.2	6.66
4113	0.722	3.27	0.503	0.01	<MDL	993	5.8	0.02	<RDL	20.4	6.01
4116	0.78	3.54	0.547	0.0005	0.697	1120	6.3	0.0213	0.351	22.1	6.25
4117	0.4588	3.57	0.5288	0.01	<0.6493	1018	6.414	0.0234	0.3629	22.73	6.106
4118	0.562	3	1	0.001	<0.569	1140	5.06	0.018	0.307	19.2	4.59
4119	0.99	3.47	0.513	0.0003	0.595	1190	5.92	0.019	0.385	21.5	6.03
4120	0.8	3.44	0.53	0.001	<MDL	1080	6.38	0.0206	0.361	23	6.49
4121	0.63	3.5	0.53	0.14	<0.14	1100	6.4	0.1	<0.1	24	6.3
4122	0.695	3.4	0.5	0.1	<0.1	1170	6.38	0.1	<0.1	23.7	6.6
4124	0.58	3.66	0.48	0.1	<RDL	1100	6	0.2	<RDL	23.8	7.12
4125	0.64	3.1	0.5	0.001	<MDL	1000	6	0.02	0.3	23.5	6
4126	1.2	3.3016	0.443	<0.455	0.6	1020	4.87	<	<	16.7	4.95
4130	0.669	2.995	0.53	0.001	<MDL	1100	5.67	0.018	0.409	20.3	6.63
4133	20	96	50	2	<MDL	32530	150	2	24	453	142
4136	0.83	4.11	0.506	0.001	<MDL	1140	6.62	0.021	0.437	22.5	6.81
4137	0.78	3.4	0.51	0.001	<MDL	1100	5.9	0.016	0.37	21	6.1
4138	0.23	3.37	0.33	<0.01	0.51	ND	3.71	0.02	0.3	13.2	4.08
4139	0.755	2.99	0.52	0	<MDL	1160	5.93	0.021	0.369	25.5	6.34
4140	0.67	3.6	0.55	0.02	<EQL	1060	6.8	0.02	0.37	21	7.1

TABLE 14 B

RAW DATA - LEACH 2

mg/L

LAB ID	Mg	Mn	Mo	Ni	Se	Ag	Sr	Ti	U	V	Zn
	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.
4101	105.7	7.7	0.042	0.563	1.42	0	2.43	0	6.69	0	8.59
4102	111	7.77	0.05	0.64	0.808	0.005	2.283	0.005	14.5	0.03	7.83
4103	99.7	7.35	MDL = 0.5	0.745	1	MDL = 0.001	1.395	MDL = 1.0	MDL = 1.0	MDL = 0.5	7.67
4104	1150.07 @ 10X	7.25	0.005 @ 5X	0.001	1.25	0.008	0.004	0.001	13.2	0.0008	8.32
				0.546	0.0007	<0.004	2.44	0.001 @ 10X	0.1 @ 10X	<0.0008	0.004 @ 5X
4105	99.3	6.06	0.036	0.482	1.3	0	1.81	0	12.8	0	6.96
4106	99.3	6.06	0.036	0.482	1.3	0	1.81	0	12.8	0	6.96
4107	99.6	7.23	0.047	0.601	1.29	0.001	2.36	0.01	12	0.005	7.65
4108	106	6.8	0.022	0.592	1.21	0.018	1.94	0.01	11.9	0.01	7.05
4109	103	7.32	0.05	0.63	1.27	0.001	2.24	0.05	12.7	0.005	7.96
4110	110	7.1	0.033	0.66	1.38	0.001	2.2	0.0073	12.8	0.002	8.2
4111	106	8.01	0.04	0.619	1.14	0.0129	2.23	0.001	12.4	0.001	9.14
4112	106	6.81	0.043	0.589	1.23	0.02	2.15	0.01	12.1	0.03	7.16
4113	106	7.16	0.045	0.644	1.35	0.012	2.33	0.004	14.6	0.001	7.15
4114	111	7.263	0.0483	0.5942	1.599	0.0323	2.34	0.006	12.59	0.05	7.275
4115	104.6	5.46	0.038	0.462	1.2	0.01	2.75	0.01	11.7	0.005	5.84
4116	105	6.91	0.045	0.577	1.33	0.001	2.14	0.0039	12.4	0.001	7.78
4117	108	7.5	0.0473	0.641	1.24	0.06	2.35	0.02	12	0.001	8.38
4118	118	7.2	0.14	0.1	1.3	0.06	2.1	0.2	12	0.1	9.1
4119	120	6.768	0.0437	0.6	1.5	0.1	2.12	0.001	0.0004	0.1	8.5
4120											
4121											
4122											
4123	122	7.62	0.2	0.63	1.88	0.1	2.3	0.2	11.5	0.1	8.15
4124	100	7	0.04	0.6	1.2	0.001	2	0.05	11	0.07	7
4125	101										
4126	114	7.55	0.051	0.577	1.3476	0.01	1.96	0.02	11.15	0.02	6.89
4127	114	172	1	16.5	1.928	0.5	2.07	1	350	1	8.47
4128	2190	7.68	0.047	0.66	37	0.004	56	0.02	1	0.001	217
4129	121	7	0.043	0.51	1.5	0.013	2.48	0.002	13.3	0.001	8.43
4130	114	4.4	0.01	0.38	1.4	0.07	2.4	0.002	13	0.003	7.6
4131	128	6.75	0.046	0.627	1.24	0.002	ND	1.55	ND	<0.01	5.47
4132	109	7.1	0.052	0.68	1.4	0.005	2.26	0.006	12.4	0.002	7.75
4133								0.02	15	0.02	8.3
4134											
4135											
4136											
4137											
4138											
4139											
4140											

TABLE 15 A

RAW DATA - WASTE 1

mg/L

LAB ID	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb
	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.
4101	0.42	0.011	0.128	0	<0.05	325	0.974	0	<0.05	0.79	0.106
4102	0.56	0.001	0.3	0.005	<MDL	1848	0.36	0.01	<MDL	0.1	<MDL
4103		MDL = 1.0	MDL = 0.041	MDL = 0.001	MDL = 0.041	1532	0.282	0.125	0.055	0.168	0.21
4104	0.03	0.009	0.003	0.0002	0.0002	2030	0.12	0.001	0.0008	0.002	0.002
						250X					0.003
4105	0	<0.005	0	<0.001	0.152	1570	0.183	0	<0.005	0.005	0.075
4106	0.054	0.005	0.824	0	<0.001	1570	0.183	0	<0.005	0.005	0.075
4107	1	0.03	0.387	0.005	<0.005	1840	0.152	0.003	0.039	0.025	0.075
4109	0.05	<0.02	0.38	0.005	0.863	1870	0.153	0.01	0.05	2.64	0.03
4110	0.041	<0.018	0.44	0.01	<0.857	1660	0.13	0.002	0.014	0.164	0.406
4111	0.122	0.005	0.164	0.001	<MDL	1890	0.19	0.004	0.017	0.3	<0.426
4113	0.2	0.1	0.526	0.0005	<MDL	700	0.104	0.001	0.002	0.02	<MDL
4116	0.03	0.01	0.326	0.01	<RDL	2040	0.087	0.02	<MDL	0.008	0.0013
4117	1.001	0.02	0.325	0.0005	<MDL	1870	0.149	0.0022	0.15	0.2	<RDL
4118	0.103	0.01	<0.3505	0.01	<0.3419	1566	0.192	0.0054	0.025	0.013	0.286
4119	0.05	0.01	1	<0.005	<1.91	2330	0.08	0.005	0.009	<0.0274	0.1043
4120	0.02	<MDL	0.214	0.0003	<MDL	1330	0.736	0.005	0.032	0.02	0.764
4121	0.42	0.0029	0.368	0.001	<MDL	1840	0.143	0.004	0.017	<MDL	<MDL
4122	0.009	0.14	0.8	0.14	<0.14	1720	0.2	0.1	0.3	0.3	0.546
4124	0.3	0.5	<0.5	0.1	<0.1	1	0.1	0.1	<0.1	6.1	0.59
4125	0.04	<RDL	0.3	0.1	<RDL	1980	0.2	<RDL	0.1	0.06	0.5
4126		0.01	<MDL	0.01	<MDL	1900	0.2	0.2	<RDL	0.2	<RDL
4130	0.01	<MDL	0.3416	0.01	<MDL	1766	0.2274	0.05	<MDL	1.35	0.09
4133	130	0.001	0.349	2	<MDL	1980	0.096	0.01	<MDL	<	<
4136	0.04	3	<MDL	8	<MDL	53170	8	8.3	0.013	0.01	<MDL
4137	0.075	0.15	0.368	0.001	<MDL	1910	0.367	0.01	0.46	365	0.439
4138		0.1	0.37	0.001	<MDL	1900	0.25	0.01	0.015	0.205	0.077
4139	0.01	<0.01	0.17	0.001	<MDL	1870	0.05	<MDL	0.025	0.006	<MDL
4140	0.1	<MDL	0.366	0	<0.01	ND	0.165	<0.01	0.01	<0.01	0.19
		0.02	0.968	0.02	<MDL	1940	0.21	0	0.015	5.15	0.451
		0.02	<EQL	0.34	<EQL	1790		0.01	<EQL	0.5	<EQL

TABLE 15 B
RAW DATA - WASTE 1

mg/L

LAB ID	Mg	Mn	Mo	Ni	Se	Ag	Sr	Ti	U	V	Zn
	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.
4101	0	<1	2.37	0	<0.05	0	0.402	0	<0.05	0	0.311
4102	77.47	0.01	0.35	0.02	<MDL	0.005	0.854	0.005	<MDL	0.05	0.04
4103	49.1	0.03	0.78	0.155	MDL = 1.0	MDL = 0.884		MDL = 1.0	MDL = 1.0	MDL = 0.5	0.445
4104	87.5 @ 10X	0.283	0.001	0.001	0.007	0.004	0.004	0.001	0.03	0.0008	0.008
4105	82.5	0.13	0.121	0	<0.01	0	0.843	0	<0.005	0	5.27 @ 10X
4105	82.5	0.13	0.121	0	<0.01	0	0.843	0	<0.005	0	5.27
4106	76.3	0.37	0.074	0.04	0.077	0.001	1.13	0.01	<0.01	0.005	26
4107	102	0.92	0.038	0.05	0.05	0.01	0.94	0.014	0.05	0.017	51.2
4109	82.6	0.53	0.06	0.04	0.06	0.001	1	0.05	<0.001	<0.005	38.9
4110	81.8	0.157	0.116	0.082	0.158	0.001	1.09	0.0019	0.0077	0.0068	14
4111	0.16	0.001	2.1	0.002	<MDL	0.0005	0.439	0.001	<MDL	0.001	0.011
4113	133	4.96	0.03	0.255	0.1	0.02	1.16	0.01	<MDL	0.03	855
4115	83.8	0.26	0.07	0.03	0.07	0.001	1.05	0.004	<MDL	0.001	20.2
4117	80.12	0.1173	0.1223	0.0155	0.0912	0.0292	1.119	0.006	<1	<0.05	8.951
4118	158	1.87	0.027	0.093	0.11	0.01	1.5	0.01	<0.01	<0.005	218
4119	24.6	<MDL	1.85	<MDL	0.07	<MDL	0.686	<MDL	0.0002	<MDL	<MDL
4120	115	0.93	0.0553	0.094	0.081	0.001	1.23	0.0014	0.0001	0.001	65
4121	79.7	0.74	0.14	<0.14	<0.1	0.06	0.9	0.2	<0.2	0.16	29.2
4122		0.67	0.0541	0.1	<0.1	0.1	0.95	0.001	<0.001	0.0005	48.7
4124	97.2	0.53	0.2	<MDL	0.5	<MDL	1.08	0.2	<MDL	0.1	49.1
4125	88	0.1	0.2	0.02	<MDL	0.01	1	0.5	<MDL	0.07	5.2
4130	103	1.06	<0.046	<0.053	<0.0065	0.01	<0.9672	<0.005	<MDL	<MDL	3.534
4133	1950	16	7.2	0.053	0.0065	0.01	0.928	0.02	<MDL	0.01	60.5
4136	104	0.07	0.305	0.02	<MDL	0.5	25.5	1	<MDL	1	349
4137	91	0.049	0.18	0.01	<MDL	0.002	1.17	0.002	0.06	0.001	2.1
4138	46.5	0.33	0.07	0.03	0.2	0.004	1.1	0.002	0.064	0.003	4.6
4139	103	0.409	0.07	0.041	0.037	<0.01	ND	0.99	ND	<0.01	50.3
4140	92.2	0.14	0.13	0.02	<MDL	0	1.14	0.01	0.01	0	39.3
				0.02	<MDL	0.005	1	0.02	<MDL	0.02	7

TABLE 16 A
RAW DATA - WASTE 2
mg/L

LAB ID	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb
	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.	Qual.	Res.
4101	0.341	0.011	0.133	0	0	278	0.798	0	0	0.643	0.162
4102	0.49	0.001	<MDL	0.005	1.56	1893	0.12	0.01	0.01	<MDL	0.62
4103	MDL = 0.5	MDL = 1.0	MDL = 1.0	MDL = 0.001	0.148	1576	0.211	0.125	0.85	0.189	0.22
4104	0.02	0.009	0.003	0.0002	1.77	2060	2 @ 250X	0.0027	0.016	0.002	1.14
											0.003
4105	0.006	0	<0.001	0	2.47	1330	0.049	0.007	0.058	0.018	2.65
4106	0.006	0	<0.001	0	2.47	1330	0.049	0.007	0.058	0.018	2.65
4107	0.05	0.005	<0.005	0.005	1.52	1790	0.089	0.004	0.088	2.48	0.849
4108	0.05	0.03	MDL = 0.46	0.005	1.49	1904	0.124	0.01	0.05	0.094	0.894
4109	0.052	0.02	<0.02	0.001	1.83	1530	0.09	0.003	0.024	0.3	1.17
4110	0.044	0.005	<MDL	0.0005	1.82	1870	0.128	0.006	0.032	0.02	<MDL
4111	0.2	0.1	<MDL	0.0005	0.0001	715	0.915	0.001	0.002	0.02	1.05
4112	0.2	0.1	<MDL	0.001	4.62	1860	0.084	0.02	0.03	0.2	0.0067
4113	0.2	0.1	<MDL	0.0005	1.56	1830	0.0987	0.0042	0.048	0.007	5.37
4114	0.03	0.01	<MDL	0.0005	1.459	1575	0.1065	0.0275	0.019	0.0159	0.844
4115	1.09	0.02	<0.45	0.01	2.96	2170	0.061	0.006	0.064	0.01	0.6973
4116	0.03	0.01	<MDL	0.005	2.32	1210	0.505	0.006	0.064	0.01	1.92
4117	0.04	0.0031	0.245	0.001	2.32	1840	0.104	0.062	0.043	0.24	1.89
4118	0.02	0.14	0.72	0.14	1.4	1950	0.19	0.1	0.3	0.63	0.63
4119	0.42	0.5	0.4	0.1	2.2	1940	0.2	0.1	0.1	0.06	1.5
4120	0.1	<MDL	0.49	0.1	2.73	1940	0.2	0.2	0.1	0.06	1.43
4121	0.3	<MDL	0.4	0.01	1.2	1800	0.1	0.05	0.03	1.7	0.8
4122	0.08	<MDL	0.4	0.01	1.14	1680	0.1	0.05	0.03	1.7	0.8
4123	0.01	<MDL	0.4181	0.001	2.62	1630	0.063	0.01	0.039	0.058	<0.7084
4124	0.01	0.15	0.45	2	34	52440	5	0.5	0.039	1.59	12
4125	0.04	0.14	0.416	0.001	0.68	1890	0.237	0.002	0.02	0.187	0.308
4126	0.067	0.1	0.45	0.001	1.2	1800	0.12	0.01	0.034	0.006	0.88
4127	<0.01	<0.01	0.21	0.001	1.17	ND	0.04	0.01	0.01	<0.01	0.5
4128	0.01	<MDL	0.468	0	1.41	1950	0.135	0.01	0.013	5.15	0.722
4129	0.01	<MDL	0.468	0.02	1.6	1710	0.11	0.01	0.023	0.5	0.61
4130	0.1	<MDL	0.48	0.02	1.6	1710	0.11	0.01	0.023	0.5	0.61

TABLE 16 B
RAW DATA - WASTE 2

mg/L

LAB ID	Mg Res.	Qual.	Mn Res.	Qual.	Mo Res.	Qual.	Ni Res.	Qual.	Se Res.	Qual.	Ag Res.	Qual.	Sr Res.	Qual.	Ti Res.	Qual.	U Res.	Qual.	V Res.	Qual.	Zn Res.	Qual.
4101	0	<1	0	<0.1	2.03	<0.05	0	<0.05	0.066	0	<0.1	0.343	0.343	0	<0.05	0	<0.05	0	<0.05	0.332	<0.05	
4102	100		1.7	0.03	0.03	0.06	0.156	MDL = 0.5	0.036	MDL = 0.5	0	<MDL	0.93	0.93	0.005	<MDL	0.1	<MDL	0.04	66.23	MDL = 2.97	
4103	68		0.088										0.884	0.884	MDL = 1.0			MDL = 1.0		0.5		
4104	91.8	0.07 @ 10X	1.1	0.001	0.077	0.001	0.0574	0.0007	0.067	0.008	0.004	<0.004	1.05	0.001	0.001	<0.001	0.11	0.01	0.0008	<0.001	123	0.008 @10X
4105	97.2		4.37		0.019		0.147		0.001	0	<0.005	0.761		0	<0.005	0	<0.0001	0	<0.005	331		
4106	81.3		4.37		0.019		0.147		0.001	0	<0.005	0.761		0	<0.005	0	<0.0001	0	<0.005	331		
4107	119		2		0.04		0.085		0.074	0.001	<0.001	1.08		0.01	<0.01	0.01	<0.001	0.005	<0.005	90.9		
4109	83.9		2.31		0.022		0.075		0.05	0.01	<0.001	0.944		0.01	<0.001	0.05	<0.001	0.016		88		
4110	99.8		1.97		0.03		0.08		0.05	0.001		0.93		0.05	<0.001	0.001	<0.001	0.005	<0.005	111		
4111	0.6		1.77		0.05		0.136		0.1	0.0016		1.09		0.0022		0.0014		0.0083		96.1		
4113	133		6.01		2.05		0.002	<MDL	0.074	0.0005	<MDL	0.441		0.001	<MDL	0.01	<MDL	0.001	<MDL	0.014		
4116	104		1.74		0.037		0.078		0.1	<MDL	0.002	1.08		0.01	<MDL	0.5	<MDL	0.03	<MDL	1040		
4117	91.31		1.294		0.0857		0.0583		0.067	0.002	0.002	1.06		0.004	<MDL	0.05	<MDL	0.001	<MDL	59.6		
4118	149		3.73		0.02		0.13		0.12	0.01	<0.001	1.155		0.006	<0.001	1	<0.001	0.05	<0.05	45.8		
4119	42.7								0.0893	0.0386		1.36		0.01	<MDL	0	<0.01	0.005	<0.005	477	<MDL	
4120	118		2.87		0.0337		0.145		0.06	0.001	<MDL	0.671		0.0023	<MDL	0.0001	<MDL	0.001	<MDL	183		
4121	130		1.86		0.14		0.1	<0.1	0.16	0.06	<0.06	1		0.2	<0.2	0.16	<0.16	0.1	<0.1	81.7		
4122			2.093		0.0277		0.1	<0.1	0.5	<0.1	<0.1	0.94		0.0082		0.0004	<0.004	0.1	<0.1	146		
4124	110		2.28		0.2		0.5	<MDL	0.62	0.1	<MDL	1.06		0.2	<MDL	5	<MDL	0.1	<MDL	192		
4125	100		1.6		0.1		0.06		0.072	0.01	<MDL	1.1		0.5	<MDL	0.04	<MDL	0.07	<MDL	42		
4126	80.3		1.741							<MDL		0.9485			<0.005	<MDL	0.005	<MDL		60.3		
4130	102		2.96		0.019		0.106		0.00984	0.01	<MDL	0.866		0.02	<MDL	0.01	<MDL	0.02	<MDL	246		
4133	2093		57		3		2		5	0.5		24.5		1	<MDL	5	<MDL	1	<MDL	1284		
4136	134		0.677		0.14		0.02	<MDL	0.2	<MDL	0.002	<MDL	1.16		0.002	<MDL	0.06		0.001		10.8	
4137	102		1.1		0.045		0.01	<MDL	0.2	<MDL	0.004	<MDL	1.1		1.06		0.058		0.003	<MDL	47	
4138	96		1.16		0.02		0.05		0.03		<0.01	ND		0.005		ND		0	<MDL	133		
4139	134		1.93		0.055		0.061		0.096	0	<MDL	1.13		0.005		0.005	<MDL	0		5		
4140	104		1.7		0.046		0.072		0.071	0.005	<MDL	0.98		0.02	<MDL	0.001	<MDL	0.02	<MDL	8.7		

APPENDIX 2 - LIST OF PARTICIPANTS

Accutest Laboratories Ltd., Nepean Ontario
Activation Laboratories Ltd. Ancaster, Ontario
AGAT Laboratories, Mississauga, Ontario
AGAT Laboratories, Calgary, Alberta
AMEC Earth & Environmental, Edmonton, Alberta
AMEC Earth & Environmental Ltd, Mississauga, Ontario
Caduceon Environmental Laboratories, Ottawa, Ontario
Entech - A Division of Agri-Service Laboratory Inc., Mississauga, Ontario
Enviro-Test Laboratories Manitoba Technology Centre Ltd., Winnipeg, Manitoba
Enviro-Test Laboratories - Sentinel Division, Waterloo, Ontario
Fisher Environmental Laboratories, Markham, Ontario
Lambton Scientific (Division of Technical Chemical Services Inc.), Sarnia, Ontario
Maxxam Analytics, Mississauga, Ontario
Maxxam Analytics Inc., Calgary, Alberta
Centre d'Expertise en Analyse Environnementale du Quebec, Laval, Quebec
Norwest Labs, Edmonton, Alberta
Ontario Ministry of Environment, Laboratory Services Branch, Etobicoke, Ontario
Paracel Laboratories Ltd., Ottawa, Ontario
Philip Analytical Services Inc., Mississauga, Ontario
Philip Analytical Services, Burlington, Ontario
PSC Analytical Services Inc., Bedford, Nova Scotia
PSC Analytical Services Inc., Edmonton, Alberta
PSC Analytical Services Inc., London
PSC Analytical Services Inc., Burnaby, British Columbia
Queen's Analytical Services Unit, Kingston, Ontario
R & R Laboratories Ltd., Peterborough, Ontario
TESTMARK Laboratories Ltd., Sudbury, Ontario
York-Durham Regional Environmental Laboratory, Pickering, Ontario

APPENDIX 3 - CORRESPONDENCE

Quality Management Unit

January 9, 2004

RE: MOE Interlaboratory Study 04-1

Thank you for your response to the invitation to participate in MOE Interlaboratory Study 04-1, Toxicity Characteristic Leaching Procedure (TCLP). Please find enclosed a copy of the Laboratory Services Branch (LSB) method E9002. Study participants are requested to use either the enclosed method **OR** US-EPA method 1311 for the processing of the solid samples provided as part of this interlaboratory study. A copy of EPA Method 1311 may be downloaded from the following web-site:

http://www.ene.gov.on.ca/environ/env_reg/er/documents/2000/RA00E0002.htm

(Please refer to the last item on this page: 2. Toxicity Characteristic Leaching Procedure (TCLP) 288 KB.)

In order to ensure consistency in the application of the method, we request that critical steps as outlined in the attachment Instruction Sheet be strictly followed. Please read this document **before** you open the test materials and start the analysis. Also note that the analytical methods listed in section 1.1.2 **ARE NOT** a requirement of this study. Participants may use their own method of choice to determine the target analytes in Table 1. This follow-up study includes regulation metals and additional common metals that are typical to this analysis. A methodology questionnaire and data reporting file are being forwarded by e-mail.

Table 1 - Target Analytes				
Aluminum (Al)	Chromium (Cr)	Magnesium (Mg)	Strontium (Sr)	Selenium (Se)
Barium (Ba)	Cobalt (Co)	Manganese (Mn)	Titanium (Ti)	Uranium (U)
Beryllium (Be)	Copper (Cu)	Molybdenum (Mo)	Vanadium (V)	
Cadmium (Cd)	Iron (Fe)	Nickel (Ni)	Zinc (Zn)	
Calcium (Ca)	Lead (Pb)	Silver (Ag)	Arsenic (As)	

Please do not hesitate to contact us if you have any questions regarding this interlaboratory study.

Your confidential Study ID Code is:

Rita Dawood
LSB ILS Coordinator
phone:416-235-5761
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INSTRUCTION SHEET

MOE INTERLABORATORY STUDY 04-1 TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP)

STUDY MATERIALS:

Provided are:

- a) Two fortified waste leachates (acidified)
- b) Two waste materials
They are ground and dried and ready for use. No further preparation is required.
- c) Two plastic bottles (1250 mL wide mouth) for making leachate in.

Caution: Please ensure that your analytical and handling procedures for these materials have been fully assessed for safety and that all specified precautions are taken.

LEACHING PROCESS:

1. Omit for this study, the steps used for determining choice of Leaching Fluid.
2. **Please use the Acid Fluid (2)**
Extraction FLUID 2 (pH 2.88 +/- 0.05), ACID, must be used. This is made by using 5.7 mL glacial acetic acid per 1.0 L of reagent water, see 5.7.1 of method.
Note: Please: Do NOT use the Buffer Fluid (1)
3. It is suggested that the supplied 1250 mL plastic bottles be used. This allows a 50 g sample portion and 1000 mL of fluid. If a smaller portion is used, such as 25 g and 500 mL, please use a container that allows adequate headspace so that agitation within the bottle is possible.
4. Use the ratio of 1:20 for solid waste sample : fluid.
5. Tumble the extraction bottle at 30 rpm for 18 +/- 2 hours. For this exercise try to be as close to 18 hours as possible.
6. Filter the leachate through a 0.7 micron glass fibre filter (acid washed).
7. Record the pH of this leachate before sample preservation.
8. Preserve the final leachate with 2 mL HNO₃/ 1.0 L, or as required to pH<2.

LEACHATE ANALYSIS:

Ensure leachates, both provided and generated by leaching waste are appropriately **digested** prior to analysis.

Using acid fluid 2 :	Waste 1	Waste2
pH of Leachate after filtering		
pH of Leachate after preservation (use HNO ₃ to pH <2)		

DATA REPORTING

All analytical data are to be reported electronically using the enclosed Excel® spreadsheet, **Data.xls**. An electronic copy of the reporting sheet will also be provided to you via e-mail. An electronic version of the Study Questionnaire will also be sent via e-mail. All relevant information regarding the preparation and analysis of the samples is to be recorded in the Excel® spreadsheet, **Questionnaire.xls** and reported electronically. All results are due by **April 23, 2004** and should be reported via e-mail to Rita Dawood at rita.dawood@ene.gov.on.ca and/or Sathi Selliah at sathi.selliah@ene.gov.on.ca.

